

A Note on the Cytology of *Athyrium anisopterum* Christ

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In most of the major manuals of Indian ferns published between 1860 and 1910 *Athyrium anisopterum* Christ was not separated from *A. puncticaule* (Blume) Moore [= *A. macrocarpum* (Blume) Bedd.]. It was recognized as a separate and distinct species by Alston and Bonner (1956) and by Sledge (1962). What Beddome (1864) called *A. macrocarpum* and the Malayan plant described by Holttum (1954, p. 550; 1968, p. 637) under the same name are both *A. anisopterum*. *Asplenium macrocarpum* var. *atkinsonii* Hook. & Bak. *sensu* Clarke (1880) also belongs here.

Athyrium anisopterum differs from *A. puncticaule* in possessing much smaller (10–20 × 2.5–5 cm), narrowly oblong, simply pinnate fronds with fragile stipes and auriculate, deeply lobed or pinnatifid, membranaceous pinnae. It always prefers moist rocks. *Athyrium puncticaule*, which grows along forest fringes, roadsides, etc., has larger fronds (25–50 × 8–25 cm) with stiff stipes. The pinnae of *A. anisopterum* have the lower base obliquely cut away and the basal acroscopic lobe well developed. They have prominent sori and lacerate indusia.

I have found both diploid and tetraploid sexual plants of *A. anisopterum* in the Himalayas. Sikkim populations (Lachen, alt. 2400 m, S. S. Bir, PAN¹ 4051, 4767) are tetraploid with 80 bivalents (Fig. 1A); this number was also reported by Mehra and Verma (1957) from Darjeeling. Tetraploid plants were also reported by Manton and Sledge (1954) in Ceylon and by Abraham et al. (1962) at Ponmudi, South India. Diploid plants from Simla (Chadwick falls, alt. 1500 m, S. S. Bir, PAN 4039, 4040) and also from Kodaikanal (Silver Cascade, alt. 1650 m, S. S. Bir) revealed with unusual clarity 40 bivalents (Bir, 1965) in spore mother cells (Fig. 2A). The tetraploids have larger spores than the diploids (Figs. 1B, 2B), and the same is true of epidermal cells and stomata. Morphologically the two taxa are distinct, as is evident from comparing silhouettes of the fronds (Figs. 1C, 2C). The two can be separated as follows:

DIPLOID PLANTS—Fronds 3 or 4 per plant; stipes 2–5 cm long; laminae broadly lanceolate, 8–15 cm long, 3–4.5 cm wide; pinnae 8–12 pairs excluding the pinnatifid apex, up to 1.5–2.5 cm long with broadly obtuse apex, cut down $\frac{2}{3}$ to the midrib into broad segments, the basal acroscopic one not much prominent; sori inconspicuous, few; spores ca. $43 \times 37 \mu$.

TETRAPLOID PLANTS—Fronds 4–12 per plant; stipes 10–15 cm long; laminae narrowly oblong, 10–12 cm long, 2.5–5 cm wide; pinnae 12–15 pairs excluding the pinnatifid apex, up to 0.8–1.5 cm long with narrowly obtuse or acute apex, often cut down $\frac{3}{4}$ to the midrib into narrow segments; sori prominent and covering the entire laminar surface, indusia conspicuous; spores ca. $60 \times 40 \mu$.

The morphological characters show that the diploids and tetraploids are distinct and easily separable. They should have separate taxonomic status. The tetra-

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¹ Abbreviation for Panjab University Herbarium, Chandigarh.

ploid matches very closely in all essential aspects an isotype of *A. anisopterum* (US 457597) collected by A. Henry in China, except that it is larger than the specimen that was examined cytologically. The altogether different diploid species will be described and named when herbarium material from other regions is studied in detail.

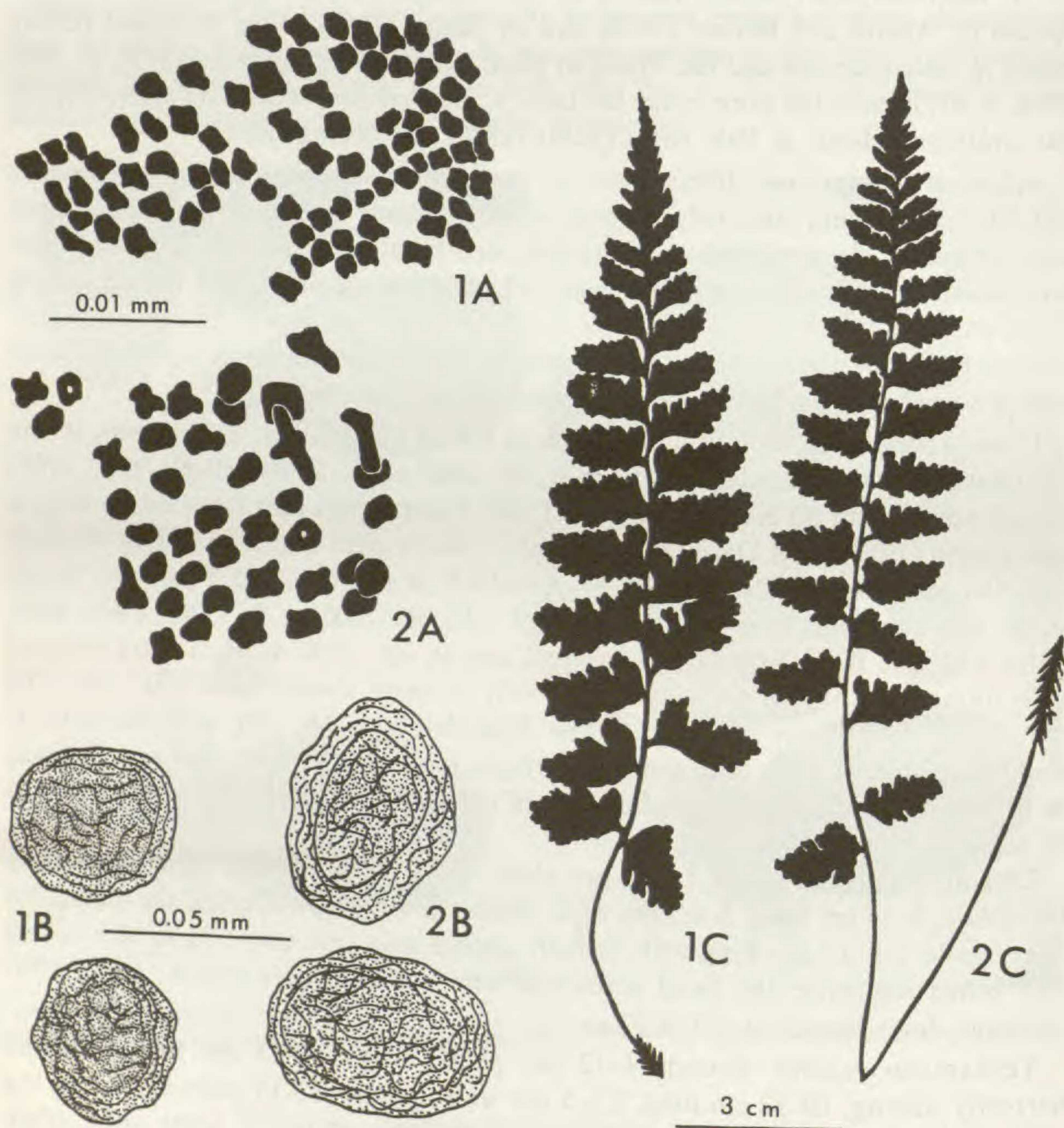


FIG. 1. *Athyrium anisopterum* (4x). FIG. 1A. Spore mother cell at meiosis of plant from Sikkim, $n = 80$. FIG. 1B. Spores. FIG. 1C. Frond of plant from Sikkim which resembles the isotype. FIG. 2. *Athyrium* sp. (2x). FIG. 2A. Spore mother cell at diakinesis of plant from Kodaikanal, $n = 40$. FIG. 2B. Spores. FIG. 2C. Frond of plant from Simla.

LITERATURE CITED

- ABRAHAM, A., C. A. NINAN and P. M. MATHEW. 1962. Studies on the cytology and phylogeny of the pteridophytes. VII. Observations on one hundred species of South Indian ferns. *J. Indian Bot. Soc.* **41**: 339-421.
- ALSTON, A. H. G. and C. B. E. BONNER. 1966. Resultats des expeditions scientifiques Genevoises au Nepal en 1952 et 1954 (Partie Botanique) 5-Pteridophyta. *Candollea* **15**: 193-220.
- BEDDOME, R. H. 1863-1864 (1865?). The ferns of Southern India. Gantz Bros., Madras.
- BIR, S. S. 1965. Chromosome numbers in some ferns from Kodaikanal, South India. *Caryologia* **17**: 107-115.
- CLARKE, C. B. 1880. A review of the ferns of Northern India. *Trans. Linn. Soc. London II, Bot.*, **1**: 425-611.
- HOLTTUM, R. E. 1954. *Flora of Malaya*, vol. II. The Ferns. Gov't. Printing Office, Singapore.
- . 1968. *A Revised Flora of Malaya*, Vol. II. Ferns of Malaya. Gov't. Printing Office, Singapore.
- MANTON, I. and W. A. SLEDGE. 1954. Observation on the cytology and taxonomy of the pteridophytic flora of ceylon. *Phil. Trans. Roy. Soc. London, B*, **238**: 127-185.
- MEHRA, P. N. and S. C. VERMA. 1954. The cytology of some *Athyrium* species from Northern India. *Ann. Bot., n.s.*, **21**: 455-459.
- SLEDGE, W. A. 1962. The *Athyrioid* ferns of Ceylon. *Bull. Brit. Mus. (Nat. Hist.), Bot.*, **2**: 277-323

NOTES AND NEWS

DALE J. HAGENAH, well known student of American pteridophytes and outstanding Michigan botanist, died on October 30, 1971. He had recently retired from his job as Senior Quality Control Engineer with the Chrysler Corporation so that he could spend full time on his study of ferns. He had also been appointed the Curator of the Herbarium at the Cranbrook Institute of Science, Bloomfield Hills, Michigan. He joined the American Fern Society in 1948 and was active in promoting its goals through his leadership of field forays and his encouragement and assistance to pteridologists here and abroad. He published five articles in the *Journal* over the years 1954 through 1966.

Hagenah's botanical interests were broad, but pteridology was his major effort. He not only carried out original research in botany, but also concerned himself with various public aspects of botany, such as the Michigan Botanical Club and especially the Michigan Natural Areas Council; to the latter he made many contributions. He was interested in the flora of Michigan in particular and the flora of the Upper Great Lakes in general. His work on ferns included not only innumerable field expeditions in Michigan and nearby Ontario, but many special investigations of critical problems. He will be remembered for his work on such problems as the distribution of the Hart's-tongue Fern, the inter-relationships of the Fragile Ferns, and hybridization in the Woodferns. At the time of his death he had become deeply interested in the Bog Clubmosses of the group of *Lycopodium inundatum*.

A more extensive biography of Dale Hagenah is being published by S. A. Cain and W. H. Wagner, Jr. (*Michigan Botanist* **11**: 60-66. March 1972) containing his complete bibliography.—W. H. Wagner, Jr., *Department of Botany, University of Michigan, Ann Arbor, MI 48104*.